WILLIAM NOEL BENSON, 1885–1957.

(Memorial Series, No. 16.)

(With Portrait, Plate xxii.)

The death of Professor William Noel Benson on August 20, 1957, removed a most versatile and distinguished geologist, who had for more than half a century made outstanding contributions to geological research in Australia and New Zealand which won him international recognition.

Born near London on 26th December, 1885, he was the son of William Benson, a shipping manager and member of an English Quaker family. Shortly after his birth the family came to Tasmania, where the young Benson received his schooling at the Friends' High School, Hobart. At the age of 18 he entered the University of Tasmania and completed a 1st year Science course. On the removal of the family to Sydney he transferred *ad eundem statum* to the University of Sydney and graduated in 1907 in Geology and Chemistry. After a year as Junior Demonstrator in Geology he went to the University of Adelaide as Acting Lecturer in Mineralogy and Petrology during Mr. (later Sir Douglas) Mawson's absence in Antarctica with the Shackleton expedition. Returning to Sydney, he resumed his teaching post in the University, and began the study of the serpentines, spilites and allied rocks of the Great Serpentine Belt of western New England, N.S.W. The award of an 1851 Exhibition Scholarship in 1911 enabled him to spend two years in petrological study and research at the University of Cambridge under Harker, Bonney and Marr, leading to the degree of B.A. (research), the Ph.D. degree having not then been established. The researches of Dewey and Flett, Bailey and others had brought the spilitic suite into prominence in Britain, and Benson's arrival, fresh from his discovery of some of the finest occurrences in the world and with ample material for study, was most opportune. A third year was spent abroad in a tour, in the company of his family, of European countries, visiting places of scenic and geological interest and studying petrological collections in Swiss, German and French universities. Appointed to a Linnean Macleay Fellowship of this Society in 1913, he continued his field investigations in the Great Serpentine Belt and in the next four years published the results of his work in a series of papers in the Proceedings. He received the degree of D.Sc. of Sydney in 1916, and in the following year left Australia on his appointment to the Chair of Geology in the University of Otago, New Zealand, previously held by Dr. P. Marshall. This position he occupied for 33 years, till his resignation for health reasons a year before he was normally due to retire. From then till the time of his death he was engaged chiefly in research in Dunedin.

Benson was a very successful and inspiring teacher, and trained many students who later filled important geological posts both at home and abroad. It was a matter of gratification to him that within a few years of his arrival in Dunedin the New Zealand Geological Survey had taken four of his graduates. In the tradition of his old chief and lifelong hero, David of Sydney, he not merely taught his students, but also set them an example of enthusiasm for and vigorous activity in original research. He laid much stress on fieldwork and, in the words of his successor, D. S. Coombs, "all his former students will remember his well-loved figure forging ahead in front of panting field-parties".

It was anything but an impressive department to which he succeeded in Dunedin. New Zealand was not yet properly awake to the national importance of university education, and anyhow all its energies were being engaged by the World War then

raging. Benson found that he had not merely to lecture and demonstrate on several branches of Geology and Mineralogy (including Vertebrate Palaeontology, which he had never studied) and supervise the work of graduate students, but also to clean his own blackboard and set out and put away specimens and diagrams used in lectures. Microscope slides had to be made on "a treadle grinding-machine of very irregular habits" at which his predecessor, himself a noted petrologist, had been wont to spend his week-ends and evenings finishing off slides previously rough-ground by students for a trifling fee. There was no technical help at all, and Benson was the sole member of the teaching staff for the first 10 years of his incumbency; then he acquired the services of a lecturer, F. J. Turner, a New Zealand graduate, who relieved him of much lecturing and other work, and was a welcome collaborator in research for 20 years until his appointment as Professor of Petrology in Berkeley University, California. The enforced isolation within the four walls of his department, with no geological company but his own, Benson found very monotonous and not a little irksome, and small wonder that he took every opportunity to get away into the field.

In those days there was one University of New Zealand with constituent colleges in Auckland, Christchurch and Wellington and the University of Otago in Dunedin; all colleges taught the same curriculum and their students sat for the same papers, many of which were set by external examiners. Benson used to relate with much enjoyment how shortly after his accession to the Dunedin chair an examination paper in petrology contained a question on serpentines set by Harker of Cambridge, doubtless in recollection of the subject of Benson's special studies. Unfortunately, through lack of time, or perhaps by a supreme effort of self-restraint, Benson had touched but briefly on the ultrabasic rocks, and his students passed the question by!

His marriage in 1923 to Miss Gertrude Helen Rawson, Professor of Home Science in the University of Otago, who survives him, was a most happy event; thereafter, with a devoted wife who shared many of his interests, a house of his own and a circle of congenial friends, life in Dunedin became for him a very pleasant thing, albeit busier than ever.

Teaching, the administration of his department and participation in university affairs engaged much of his time and energy, but nearest and dearest to his heart to the end of his days was geological research, and it is chiefly for this that his name will endure. The impressive record is contained in more than 70 papers written by him, alone or in collaboration with colleagues.

Already in his student days in Tasmania geology had been his hobby, and in addition to attending the prescribed excursions he had made a point of examining geologically any district in which he happened to be, thus acquiring personal knowledge of much of the island. His early interest received further stimulus on his coming to Sydney, and he quickly became familiar with the geology of many parts of this State. While still a student he wrote a paper on the geology of the Newbridge area near Bathurst, published in our PROCEEDINGS in 1907, and three years later the results of his investigation, begun in 1905, of the Hornsby and Dundas volcanic breccia-necks near Sydney, were published by the Royal Society of New South Wales. A note on Tertiary theralitic and essexitic dolerites in 1911 drew attention to what has since been recognized as an important and widespread intrusive accompaniment of early Tertiary volcanic activity in eastern Australia.

While in Adelaide Benson studied the petrology of some of the pre-Cambrian rocks of the Mt. Lofty Range and extended his observations to the Broken Hill area of New South Wales. He recognized the existence of the long meridional Mundi Mundi fault forming the western boundary of the Barrier Ranges, and was the first to show that the Mt. Lofty plateau is really a great horst bounded by step-faults on both west and east.

Probably as the result of his South Australian experience he contemplated a comprehensive study of metamorphism in New South Wales, in the Barrier Ranges and the Cooma and Bathurst areas, but eventually his attention became focussed on the

ultrabasic rocks, and in 1909 he began work on those in the Great Serpentine Belt. The examination and mapping of this area inevitably led to a study of its other geological features, and thus was initiated that fine series of researches with which the name of Benson will always be associated. A preliminary examination of the Nundle area in the south-east before his departure for England was followed by a rapid reconnaissance survey of the whole belt—over 1,000 square miles—in 10 weeks; this included not only the igneous rocks, but also the Devonian and Carboniferous stratigraphy, the folding and thrusting, the tectonic environment of the serpentines, the palaeontology and the geomorphology of the region. All this, be it noted, in the days when Land Rovers were unknown and air photographs undreamt of, when the field geologist had to be self-propelled, and "*solvitur ambulando*" was perforce a guiding principle. Inevitably some of his interpretations were at fault, but subsequent workers have testified to the amazing accuracy of his insight and observations. His intention of studying parts of the Belt in detail was partly carried out, but eventually frustrated by his departure from Australia, and the writing up of the later parts of the Serpentine Belt series was completed during his first few years in Dunedin. The last part, embodying a reconnaissance survey of the Currabubula area, reported an extension of the Carboniferous glacial beds described the previous year from the Seaham-Paterson district by Sussmilch and David.

In New Zealand Benson threw himself with characteristic enthusiasm into local geological research. A much-needed summary of New Zealand stratigraphy, derived from published papers, verbal discussions with colleagues and personal observations, was presented as his Presidential Address to Section C of the Australasian Association for the Advancement of Science in 1921 and later published in abridged form, and for some years served as a standard text for New Zealand students.

Almost from the first he was attracted to the Cainozoic basic rocks of eastern Otago, previously examined by Marshall. The study of this extraordinarily intricate and fascinating volcanic assemblage and its tectonic environment occupied him at intervals during the rest of his life. A detailed geological map of an area of 400 square miles on a scale of 4 inches to the mile was prepared, and five major and a few minor papers on it were published between 1939 and 1946, partly with the collaboration of F. J. Turner and others, but the great work was still unfinished at the time of his death.

A most complete and exhaustive study of the geology of the area about Preservation and Chalky Inlets in the Fiordland region, made in conjunction with various colleagues including R. A. Keble of Melbourne, demonstrated *inter alia* the striking similarity of the graptolite-bearing Lower Ordovician succession to that of Victoria. Previously with Keble he had investigated the little known Ordovician graptolitic rocks in the north of the South Island.

Benson always had a keen interest in palaeontology, and described in conjunction with F. Chapman (Vic.) and W. S. Dun (N.S.W.) several elements of the Devonian and Carboniferous faunas of the Great Serpentine Belt. One of his most interesting discoveries was that of the new Lower Carboniferous coral genus *Amygdalophyllum* (originally intended to be called *Oophyllum*), which has since been found in many places beyond the confines of this State and has considerable stratigraphical value. He was ever on the lookout for Palaeozoic radiolarian rocks in New Zealand, and in 1937, to his great delight, discovered a very small lens of radiolarian limestone in an extensive and widespread sequence of argillites, greywackes and phyllites near Dunedin, which had up till then yielded no trace of fossils. The discovery was made during a holiday picnic, when, somewhat bored by feminine society, he had wandered off in search of geological diversion.

But his greatest palaeontological thrill was got from the almost accidental discovery in 1948 of late Middle Cambrian trilobites in limestone in the Cobb River country in the north of the South Island ("after teaching for 31 years that no such

things existed!"). The occurrence was further investigated in succeeding years and a rich and very varied fauna was revealed. A short account of it was given at the International Geological Congress (Mexico) in 1956.

Benson's early love for geomorphology found ample scope in New Zealand. He was particularly interested in the complex landform patterns of the southern part of the South Island, which he described in a series of interesting papers lavishly illustrated with block diagrams and panoramic sketches, in the drawing of which he had much skill. He demonstrated convincingly the existence in Fiordland of a Cretaceous peneplain much deformed, and truncated by a late Tertiary peneplain, itself subjected to Quarternary uplift and warping. Strangely enough, he does not seem to have been deeply interested in glaciology, nor in the evidences of expiring vulcanism so well exhibited in the North Island.

Through his wide acquaintance with the geology of Australia and New Zealand he was peculiarly fitted to discuss the past history of these lands in relation to each other and to the island groups of the south-west Pacific. His first paper on this topic, on Palaeozoic and Mesozoic Seas in Australasia, was one of the earliest essays in Australasian palaeogeography; another, on the Structural Features of the Margin of Australasia, was a synthesis involving an extensive survey of pertinent literature in several languages on the geology of New Guinea, Indonesia and a number of Pacific island groups.

Benson was an avid reader, a fact to which every one of his papers bears witness in the length of its appended bibliography. His wide and intimate acquaintance with geological literature is seen in his scholarly review papers on the Origin of Serpentine and Conditions accompanying the Intrusions of Basic and Ultrabasic Rocks, both inspired by his researches in New South Wales. Two compilations that involved considerable delving into literature were his Census and Index of the Burindi Fauna and Materials for the Study of the Devonian of Australia, both indispensable to students of the Upper Palaeozoic stratigraphy of Australia. With R. A. Keble he was responsible for a monumental bibliography of the Graptolites of Australia, the revision of which was one of the tasks planned for his retirement but never completed.

Many of his regional papers are prefaced with historical summaries of geological work already done, dating back to the times of the early explorers. These interesting and valuable records throw light on one of Benson's characteristics; like E. C. Andrews he was sensitively responsive to the romance of history. A scrutiny of David's Geological Map of the Commonwealth of Australia thrilled him with the visions it conjured up of venturesome journeys by the pioneers who laid the foundations of our knowledge, and the study of stratigraphy attracted him as affording entrancing glimpses through "magic casements opening on the foam" of the uncharted seas of the dim and distant past.

That the applied aspects of geology also had their appeal to him is shown by papers on landslides in relation to engineering and contributions to the study of endemic goitre in New Zealand through an examination of its incidence in relation to the regional geology and of the geological role of iodine.

During the whole period of his residence in New Zealand he retained a lively interest in Australian geology and geologists, and through his continued membership of the Royal Society of New South Wales and of this Society he was able to keep in close touch with developments in this State. In particular he followed closely the records of further work in the Great Serpentine Belt, and in letters made frequent and nostalgic reference to his travels, adventures and discoveries in it, of which he retained most vivid memories. To the work of fellow geologists he invariably accorded a tribute of unstinted praise and admiration.

Constant preoccupation with a multitude of absorbing interests was reflected in a frequent air of abstraction and occasional absent-mindedness, characteristics which were in evidence even before he left Australia. Some of his earlier papers are notable for their long *erratum* lists, and for their paucity of subheadings and paragraphs.

These were the marks of a mind eager and overflowing with ideas clamouring for expression, and were clearly related to the impossibility of making his pen keep pace with his thoughts; they were not infrequent also in his letters, typed by himself, to his intimate friends. He was a prolific correspondent, whose letters were usually long and packed with interesting information, comment and reminiscence, largely geological but often personal, manifesting a generous nature, a sly but gentle humour, and keen enjoyment of the strenuous life. Sometimes he deplored the superficiality engendered by having to lecture on so many aspects of geology, and the difficulty of keeping abreast of current petrological thought and technique.

Apart from occasional short visits to Australia and attendance at Pacific Science Congress meetings there and in Japan, his first real respite from 17 years of continuous teaching came late in 1933, when, having gained a Carnegie Fellowship, he embarked for England accompanied by his wife and by 800 rock specimens and more than 1,000 micro-slides which he took in the hope (vain, as it turned out) of completing his study of the Otago volcanic rocks away from interruptions. This was typical of the man, for, overworked and mentally and physically fatigued as he often was, his usual method of finding relief was by a change of occupation. Once, when at the end of a strenuous academic year, he entered hospital for an operation, he had what he called "about the most restful spell I had enjoyed [!] during several exceedingly busy years".

Continuous work at high pressure eventually and inevitably told on an overtaxed heart, and Benson was forced to give up active teaching at the end of 1949. For a year he rated as Research Professor, and after his formal retirement continued to occupy a room in the Geology Department. He accepted the situation philosophically, and was even able to write: "I am immensely grateful that my time is no longer interrupted by teaching and administrative work nor by examining, the most disgustful of all duties." He planned to finish the work on the Middle Cambrian beds and above all the Memoir on the Dunedin rocks (which through its sheer magnitude had become a regular Old Man of the Sea), and to this end made another trip overseas with his wife. On the way back in 1955 he was able to spend a few days in Sydney in happy reunion with some of his oldest and dearest friends. Back in New Zealand he settled down to work again, but to his disappointment found himself physically unable to revisit several critical exposures of volcanic rocks in the hilly country in and about Dunedin, while geological reading was handicapped by the fact that the University Library was up two flights of stairs. When health permitted he busied himself with a final review of his Dunedin typescript, and, as a diversion, with the revision of the bibliography of Australian graptolites and the writing of a short paper on examples of tide-controlled underwater topography in New South Wales and New Zealand.

With great eagerness he looked forward to giving a short account of his Middle Cambrian discovery at the Dunedin Australian and New Zealand Association for the Advancement of Science meeting in January, 1957, and to showing the visitors some features of his Dunedin lavas in the field with the aid of a series of "dissected block-diagrams that almost talk". This, as he foresaw, was his geological swan-song, and a few months later he died after a short illness.

Benson's eminent services to geology were recognized during his lifetime. He was chosen President of Section C of the Australasian Association for the Advancement of Science in 1921, and President of the Royal Society of New Zealand, 1945-7. He received in 1933 the Hector Medal and in 1944 the Hutton Medal of the Royal Society of New Zealand, in 1945 the Clarke Memorial Medal of the Royal Society of New South Wales, the Lyell Fund of the Geological Society of London in 1923, and its Lyell Medal in 1939, and the Mueller Medal of the Australian and New Zealand Association for the Advancement of Science in 1951. He was elected a Fellow of the Royal Society in 1941, a correspondent of the Geological Society of America in 1949 and an honorary member of the Mineralogical Society in 1954. On his retirement he received the honorary degree of Doctor of Science from the University of New Zealand.

I have to thank Prof. D. A. Brown, University College, Canberra, for kindly procuring the photograph and checking the manuscript. W.R.B.

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